2/28/18

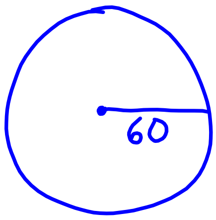
"Its easy to be happy when people do what they're supposed to."- Chris Callahan

HW: Related Rates Word Problems #2
Test 2 on Wednesday 3/7

AIM: How do we solve Related Rate problems?

Warm Up:

1. Assume that oil spilled from a ruptured tanker spreads in a circular pattern whose radius increases at a constant rate of 2 ft/sec. How fast is the area of the spill increasing when the radius of the spill is 60 ft?



What we know:

$$\frac{dr}{dt} = 2\frac{ft}{sec}$$

$$r = 60ft$$

What we need:

$$\frac{dA}{dt}$$

How fast area increases,

What equation RELATES the information?

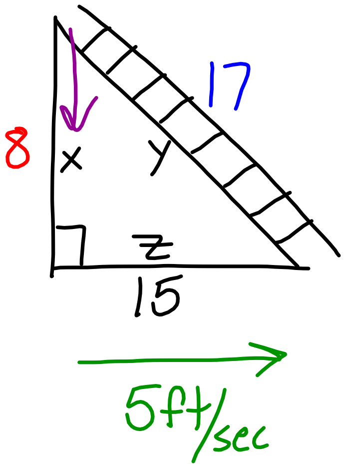
$$A = \pi r^2$$

$$\frac{dA}{dt} = 2\pi r\frac{dr}{dt}$$

$$\frac{dA}{dt} = 2\pi(60ft)\left(2\frac{ft}{sec}\right)$$

$$\boxed{\frac{dA}{dt} = 240\pi \frac{ft^2}{sec}}$$

3. A 17-foot ladder is leaning against a wall. If the bottom of the ladder is pulled along the ground away from the wall at a constant rate of 5ft/sec, how fast will the top of the ladder be moving down the wall when it is 8 feet above the ground?



Know

$y = 17$

$x = 8$

$z = 15$ $\quad \frac{dz}{dt} = 5\,ft/s$

Need:

$\frac{dx}{dt}$

$$x^2 + z^2 = y^2$$
$$8^2 + z^2 = 17^2$$
$$64 + z^2 = 289$$
$$z^2 = 225$$
$$z = 15$$

Equation: $x^2 + z^2 = y^2$

Ladder does NOT change size

$$2x\frac{dx}{dt} + 2z\frac{dz}{dt} = 2y\frac{dy}{dt}$$

$$2(8)\frac{dx}{dt} + 2(15)(5) = 2(17)(0)$$

$$16\frac{dx}{dt} + 150 = 0$$
$$-150 \quad -150$$

$$\frac{16\frac{dx}{dt}}{16} = \frac{-150}{16}$$

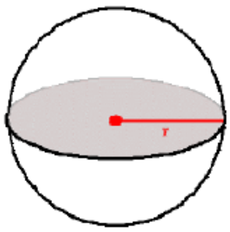
$$\frac{dx}{dt} = -9.375\,\frac{ft}{sec}$$

Ladder moves down the wall @ $9.375\,\frac{ft}{sec}$

Question: A spherical snowball with an outer layer of ice melts so that the *volume* of the snowball decreases at a rate of 2 cm^3/min.

(a) How *fast is the radius changing* when diameter of the snowball is 10 cm?

(b) How fast is **surface area** of the snowball *decreasing* at this time?

	The **volume** of a sphere is given by the equation: $$V = \frac{4}{3}\pi r^3$$	The **surface area** of a sphere is given by the equation: $$S = 4\pi r^2$$

2. A spherical balloon is to be deflated so that its radius decreases at a constant rate of 15 cm/min. At what rate must air be removed when the radius is 9cm?